Webasto

Luftheizgeräte
Air heaters
Appareils de chauffage à air chaud

Einbauanweisung
Installation Instructions
Notice de montage

HL 90

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1 Statutory regulations governing installation

Type approvals according to ECE-R 10 (EMC) and ECE-R 122 (Heater) exist for the HL 90 heater.

See chapter 11, "Technical data" for the approval number.

Primarily the regulations of Annex VII of the Directive 2001/56/EG and Part I and Annex 7 of the directive ECE-R 122 must be observed for the installation.

NOTE:
The provisions of these Directives are binding within the territory governed by EU Directive 70/156/EEC and should similarly be observed in countries without specific regulations!

IMPORTANT:

Failure to follow the installation instructions and the notes contained therein will lead to all liability being refused by Webasto. The same applies if repairs are carried out incorrectly or with the use of parts other than genuine spare parts. This will result in the invalidation of the type approval for the heater and therefore of its *homologation / ECE type licence*.

1.1. Extract from directive ECE-R 122 Part I and Annex 7

Start of extract.

Part I

5.3 Vehicle Installation Requirements for Combustion Heaters and for Electric Heaters

5.3.1 Scope

5.3.1.1 Subject to paragraph 5.3.1.2, heaters shall be installed according to the requirements of paragraph 5.3.

5.3.1.2 Vehicles of category O having liquid fuel heaters are deemed to comply with the requirements of paragraph 5.3.

5.3.2 Positioning of heater

5.3.2.1 Body sections and any other components in the vicinity of the heater must be protected from excessive heat and the possibility of fuel or oil contamination.

5.3.2.2 The heater shall not constitute a risk of fire, even in the case of overheating. This requirement shall be deemed to be met if the installation ensures an adequate distance to all parts and suitable ventilation, by the use of fire resistant materials or by the use of heat shields.

5.3.2.3 In the case of M2 and M3 vehicles, the combustion heater must not be positioned in the passenger compartment. However, an installation in an effectively sealed envelope which also complies with the conditions in paragraph 5.3.2.2 may be used.

5.3.2.4 The label referred to in Annex 7, paragraph 4, or a duplicate, must be positioned so that it can be easily read when the combustion heater is installed in the vehicle.

5.3.2.5 Every reasonable precaution should be taken in positioning the heater to minimize the risk of injury and damage to personal property.

5.3.3 Fuel supply

5.3.3.1 The fuel filler must not be situated in the passenger compartment and must be provided with an effective cap to prevent fuel spillage.

5.3.3.2 In the case of liquid fuel heaters, where a supply separate from that of the vehicle is provided, the type of fuel and its filler point must be clearly labelled.

5.3.3.3 A notice, indicating that the heater must be shut down before refuelling, must be affixed to the fuelling point. In addition a suitable instruction must be included in the manufacturer's operating manual.

5.3.4 Exhaust system

5.3.4.1 The exhaust outlet must be located so as to prevent emissions from entering the vehicle through ventilators, heated air inlets or opening windows.

5.3.5 Combustion air inlet

5.3.5.1 The air for the combustion chamber of the heater must not be drawn from the passenger compartment of the vehicle.

5.3.5.2 The air inlet must be so positioned or guarded that blocking by rubbish or luggage is unlikely.

5.3.6 Heating air inlet

5.3.6.1 The heating air supply may be fresh or re-circulated air and must be drawn from a clean area not likely to be contaminated by exhaust fumes emitted either by the propulsion engine, the combustion heater or any other vehicle source.

5.3.6.2 The inlet duct must be protected by mesh or other suitable means.

5.3.7 Heating air outlet

5.3.7.1 Any ducting used to route the hot air through the vehicle must be so positioned or protected that no injury or damage could be caused if it were to be touched.

5.3.7.2 The air outlet must be so positioned or guarded that blocking by rubbish or luggage is unlikely.

5.3.8 Automatic control of the heating system

5.3.8.1 The heating system must be switched off automatically and the supply of fuel must be stopped within five seconds when the vehicle's engine stops running. If a manual device is already activated, the heating system can stay in operation.

ANNEX 7

ADDITIONAL REQUIREMENTS FOR COMBUSTION HEATERS

7 Warning light

7.1 A clearly visible tell-tale in the operator's field of view shall inform when the combustion heater is switched on or off.

End of extract.

2 Use of the air heaters

Webasto HL 90 are heaters are designed

- to heat the cab and the passenger compartment
- to defrost the vehicle windows
- to heat vehicle bodies.

They are not designed for heating cargo areas used to carry hazardous substances.

The heaters operate independently of the engine and are connected to the fuel tank and the electrical system of the vehicle.

They may be used for vehicles with either water or air-cooled engines.

3 To install the heater

The standard scope of delivery of the heater consists of:

- 1 Heater
- 2 Supports
- 2 Clamping bands
- 2 Turnbuckles
- 1 Intake manifold
- 1 Fuel metering pump

The heater must be installed on a flat surface as shown in Figures 1 and 2. Make the hole pattern as shown in Figure 2.

The floor attachment can be aligned within the specified tolerances by loosening or tightening the turnbuckles and clamping bands.

The screws of the turnbuckles must be tightened to 5 Nm, the bolts (M8) of the supports must be tightened to 12 Nm.

The installation dimensions and space requirement for service access are shown in the installation drawing (Figures 1 and 2). The specified horizontal and axial angles must not be exceeded.

The heater is not allowed to be installed in the passenger compartment.

If the heater is installed on the exterior, ensure that it is fitted in a position where it is protected from splashing water and spray.

In the case of installations in which the heater surface could be touched inadvertently or flammable materials could come into contact with the heater surface, it is obligatory to mount a shield (Webasto accessory) over the heat exchanger, see Figure 2. For this purpose, the shield is clamped between the support and the mounting surface in the vehicle, see Figure 3. The position must be selected so the return pin on the temperature sensor can be reached through the cut-out in the shield.

The air heater's heat exchanger can be used for a maximum of 10 years and must then be replaced by the manufacturer or one of its authorised workshops using a genuine spare part. A label must then be affixed to the heater showing the date of sale of the heat exchanger and the wording "Genuine spare part". If exhaust pipes pass through compartments used by people, the pipes must also be replaced by genuine spare parts after 10 years.

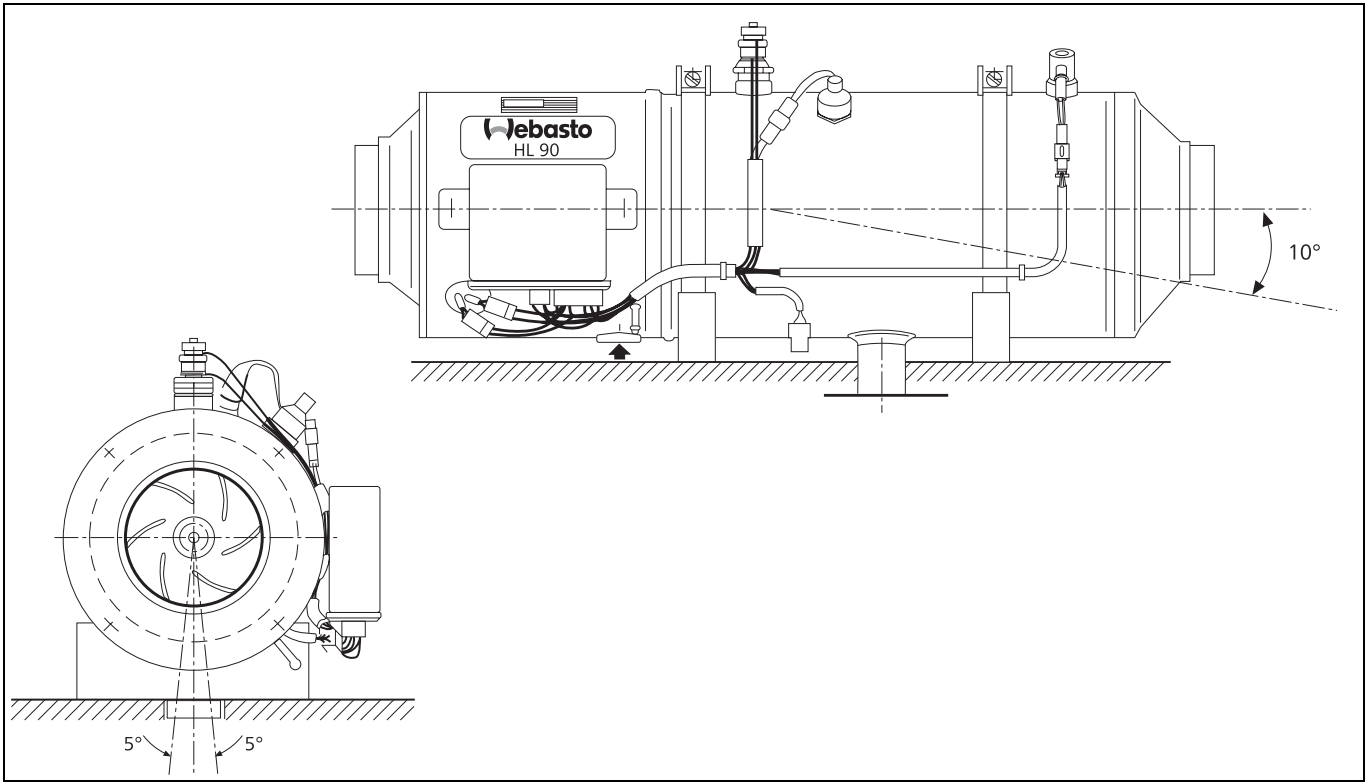


Figure 1: Possible installation location

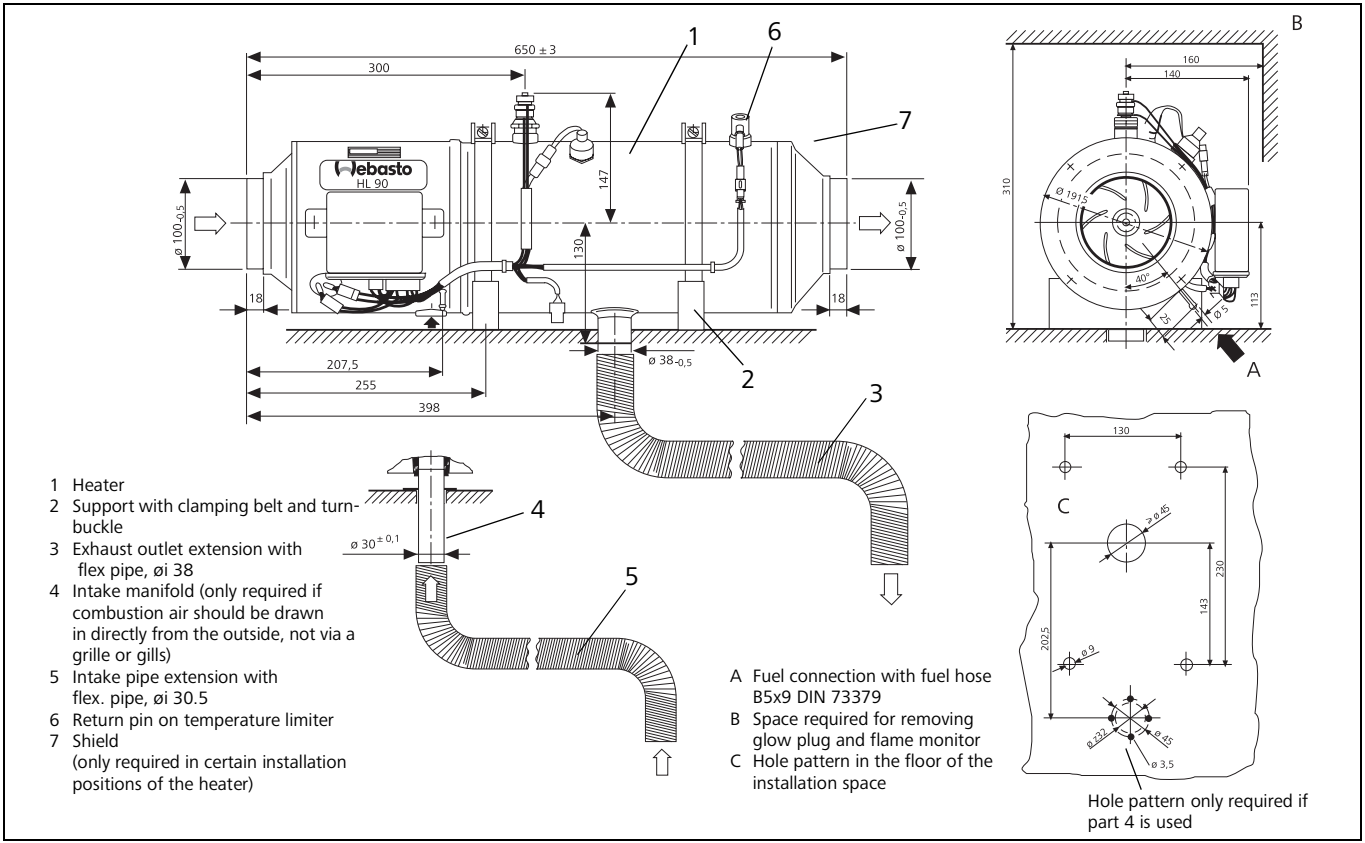

1 Heater
2 Support with clamping belt and turn-buckle
3 Exhaust outlet extension with flex pipe, øi 38
4 Intake manifold (only required if combustion air should be drawn in directly from the outside, not via a grille or gills)
5 Intake pipe extension with flex. pipe, øi 30.5
6 Return pin on temperature limiter
7 Shield (only required in certain installation positions of the heater)
A Fuel connection with fuel hose B5x9 DIN 73379
B Space required for removing glow plug and flame monitor
C Hole pattern in the floor of the installation space
Hole pattern only required if part 4 is used
650 ± 3
300
207,5
255
398
147
130
18
ø 100-0,5
ø 38-0,5
ø 30 ± 0,1
160
140
310
113
40°
130
230
143
2025

Figure 2: Installation drawing

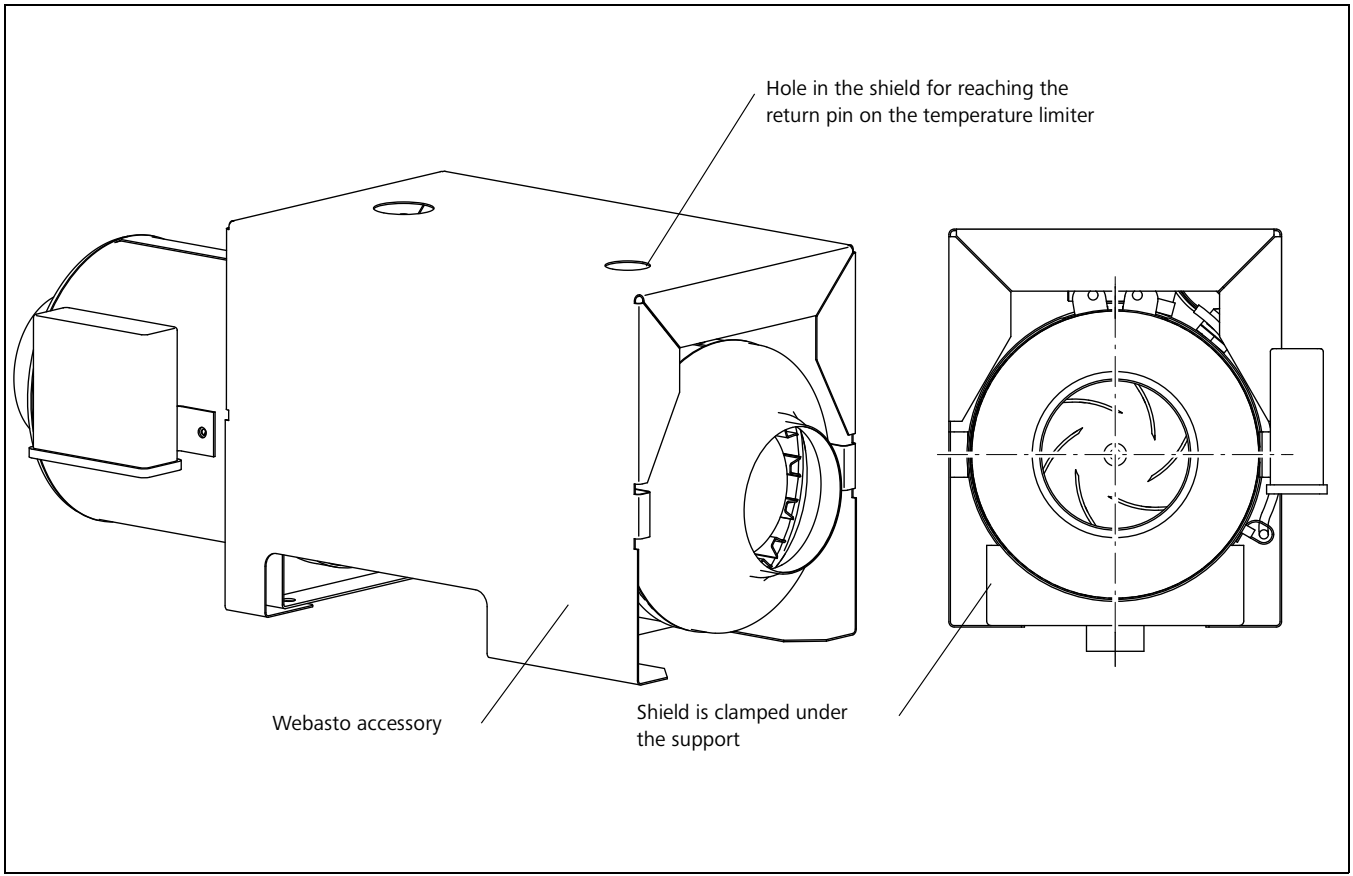

Hole in the shield for reaching the return pin on the temperature limiter
Webasto accessory
Shield is clamped under the support

Figure 3: To install the shield

4 Factory plate

The model plate must be positioned so that it cannot be damaged and must be clearly legible when the heater is installed (otherwise a duplicate model plate must be used).

The installer must ensure that the year of initial start-up is indelibly marked on the model plate (see Figure 4).

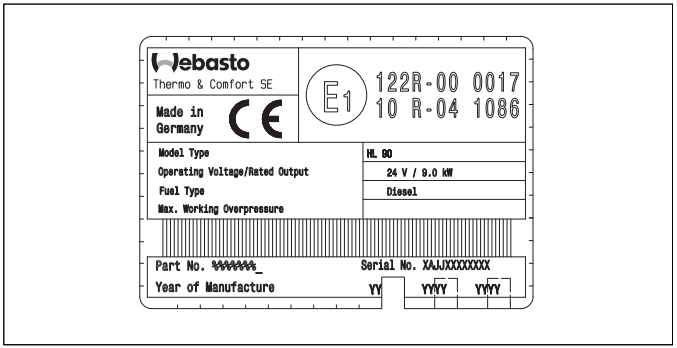


Figure 4: Factory plate corresponding to HL 90/24 V heater

5 Hot air system

Integrating the heater into an existing air system belonging to the vehicle requires careful harmonisation and is not recommended.

The air heater can be used both in fresh air mode for heating a passenger compartment and a driver's cab as well as in recirculated air/fresh air mode for vehicle bodies. If the air heater is installed in a vehicle body for use in recirculated air mode, a sticker with the following content must be affixed to the inside of the entrance door:
"No-one is allowed to remain in the enclosed loadspace when the heater is switched on!"

Due to the risk of poisoning and suffocation, the intake opening for the hot air system must be arranged so that exhaust gases from the vehicle's engine and the heater itself cannot be sucked in under normal operating conditions. This also applies even if a blower is used on the heater output side, e.g. by sucking in air from the engine compartment.

The intake temperature of the heating air must not exceed +30 °C.

Minimum internal diameter of the hot air line:

100 mm

Maximum air pressure differential between the intake and outlet side of the hot air line:

2.5 mbar (25 mm water column)

If these values are exceeded the temperature limiter will trip.

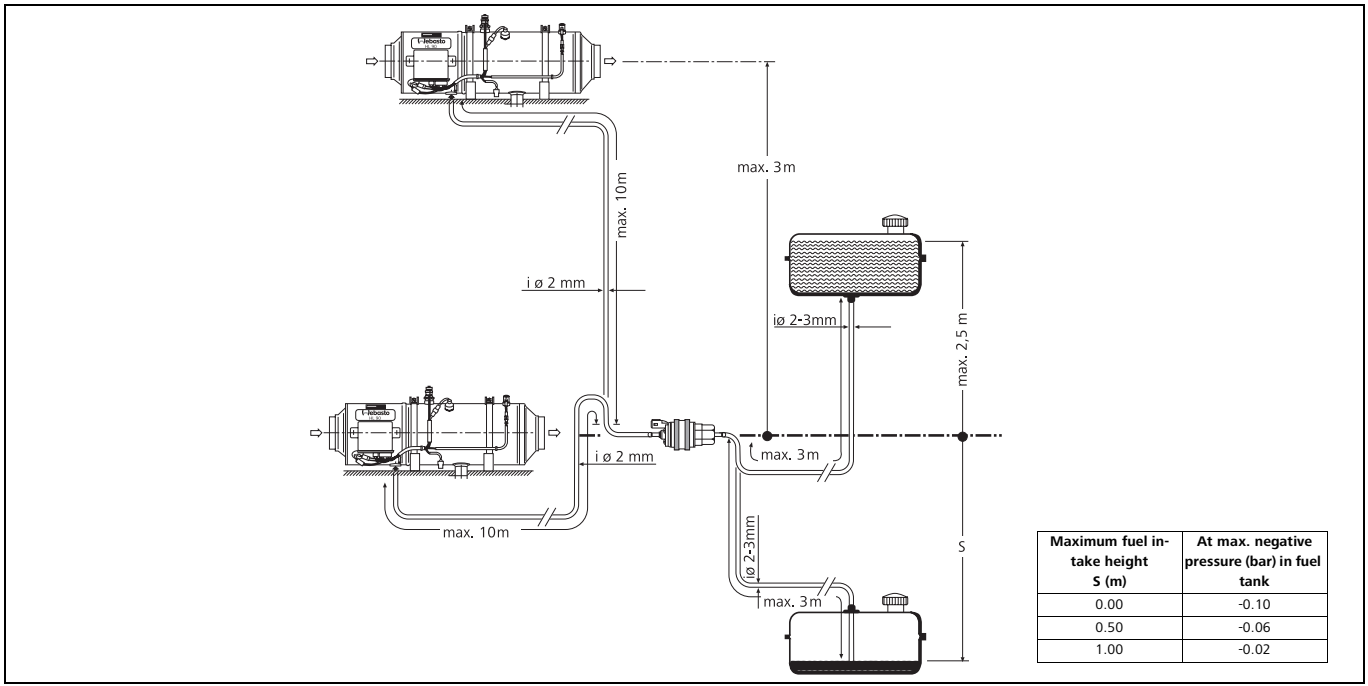
The hot air hose must be secured at its connection points.

When used in recirculated air mode, measures must be taken to prevent the heater sucking in its own heated air.

6 Fuel supply

The fuel is taken from the vehicle fuel tank or from a separate fuel tank. The values for the maximum pressure at the fuel extraction point are shown in Figure 5.

A sign must be affixed to the fuel filler neck warning that the heater must be switched off before refuelling.



Maximum fuel intake height S (m)	At max. negative pressure (bar) in fuel tank
0.00	-0.10
0.50	-0.06
1.00	-0.02

Figure 5: Fuel supply

6.1. Fuel supply with fuel extractor

In vehicles with large engines (trucks), the fuel must be extracted from the fuel tank or a separate, non-pressurised tank (see Figures 6 and 7). This separate fuel extractor precludes any effect of pressure.

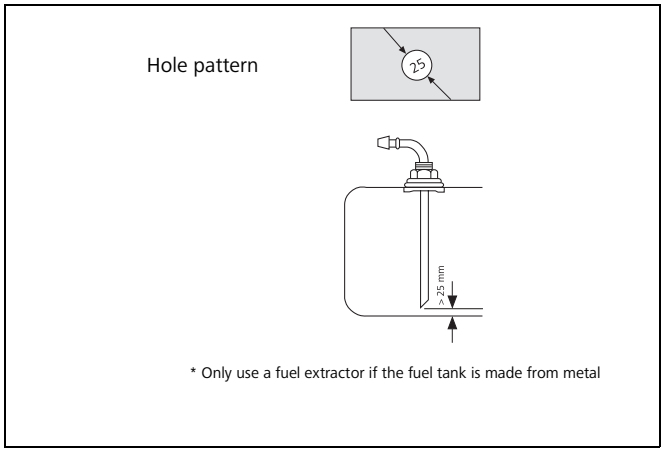


Figure 6: Webasto fuel extractor

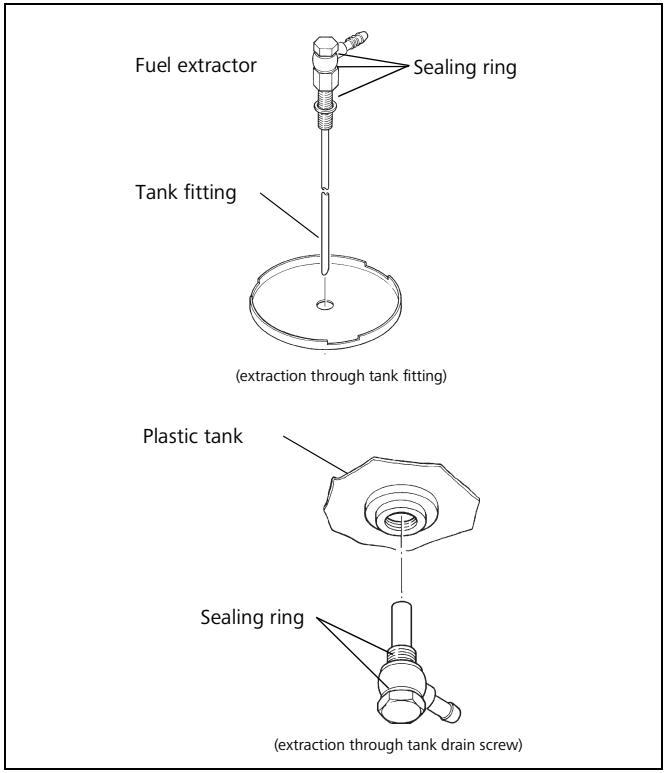


Figure 7: Fuel extraction from the plastic tank

6.2. Fuel lines

Only steel, copper and plastic lines of plasticised, light and temperature-stabilized PA 11 or PA 12 (e.g. Mecanyl RWTL) pursuant to DIN 73378 may be used for the fuel lines.

Since the lines normally cannot be routed with a constant rising gradient, the internal diameter must not be allowed to exceed a certain size. Air or gas bubbles will accumulate in lines with an internal diameter of more than 4 mm and these will cause malfunctions if the lines sag or are routed downwards. The diameters specified will ensure that bubbles do not form.

The lines should not be routed downwards from the metering pump to the heater.

Unsupported fuel lines must be secured to prevent them sagging. They must be installed in such a way that they cannot be damaged by flying road chippings and high temperatures (exhaust line).

Connecting two pipes with a hose

The correct procedure for connecting fuel lines with hosing is shown in Figure 8.

Ensure that there are no leaks!

6.3. Metering pump

The metering pump is a combined delivery, metering and shut-off system and is subject to certain installation criteria (see Figure 8).

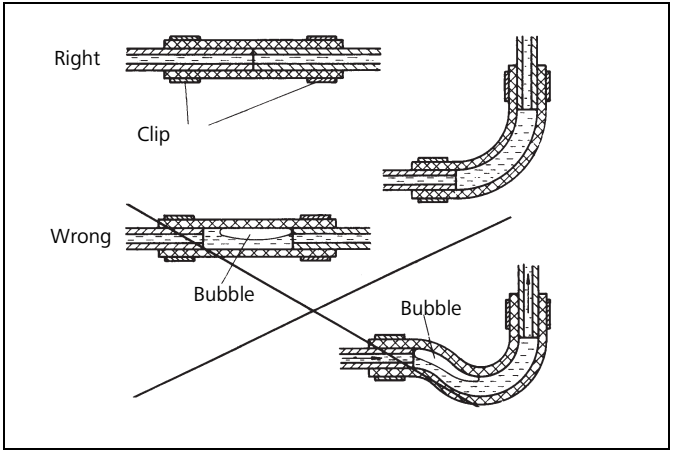


Figure 8: Pipe / hose connection

6.3.1. Installation location

Before installing the metering pump, ensure that the maximum pressure occurring at the pickup point is no more than 0.2 bar.

It is advisable to install the metering pump in a cool place. The maximum ambient temperature must not exceed +40 °C at any time during operation.

The metering pump and fuel lines must not be installed within range of the radiated heat from hot vehicle parts. A heat shield must be used if necessary.

The pump should ideally be installed near the tank.

6.3.2. Installation and attachment

The metering pump must be secured with a vibration-damping mounting. Its installation position is limited as shown in Figure 9 in order to ensure effective automatic bleeding.

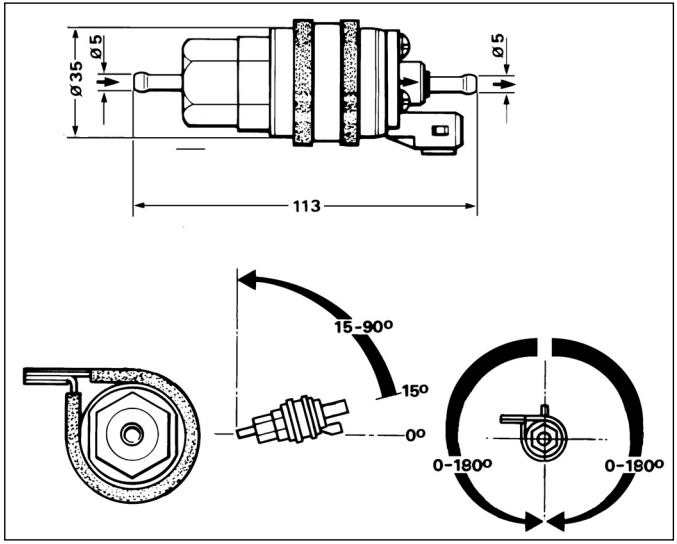


Figure 9: Metering pump without diaphragm damper

6.4. Fuel filter

Only a Webasto filter, order no. 487 171, is allowed to be used if the fuel is expected to be contaminated. Install vertically if possible, however at least horizontally (check flow direction).

7 Combustion air supply

Under no circumstances may the combustion air be taken from areas occupied by people. The combustion air intake opening must not point in the direction of travel. It must be located so that it cannot become clogged with dirt or snow and cannot suck in splashing water.

The combustion air intake line (internal diameter min. 30 mm) may be up to 5 m in length and contain several bends totalling 360°. The minimum bending radius is 45 mm.

NOTE:
If the combustion air intake line cannot be installed so that it slopes downwards, a water drain hole with a diameter of 4 mm is to be made at its lowest point.

If the heater is installed in a general installation space near the vehicle's fuel tank, the combustion air must be taken in from the outside and the exhaust fumes discharged into the atmosphere. The openings must be splash-proof.

A ventilation opening measuring at least 10 cm^2 is required if the heater is installed in an enclosed box. The size of the ventilation opening must be increased subject to consultation with Webasto if the temperature in the box exceeds the permitted ambient temperature of the heater (see Technical data).

7.1. Intake silencer

It is recommended for the intake silencer (order no. 198 56A) to be installed in order to reduce intake air noise (Figure 10). This is placed on the intake manifold.

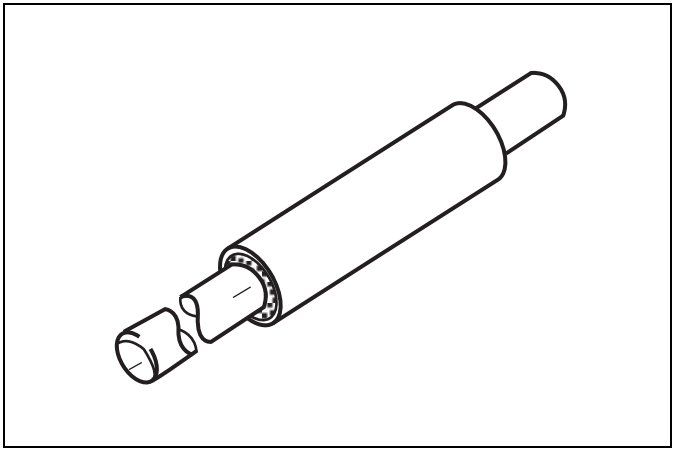


Figure 10: Intake silencer

7.2. Combustion air intake line

Length of combustion air intake line

With silencer:	max. 3 m
Without silencer:	max. 5 m

Internal diameter of the lines:	30 mm
Minimum bending radius:	45 mm
Total bends:	max. 360°

8 Exhaust line

Rigid pipes of unalloyed or alloyed steel with a minimum wall thickness of 1.0 mm or flexible piping of alloyed steel only must be used as the exhaust line. The exhaust pipe is secured to the heater using a clamping collar, for example.

It must not be possible for condensate or water to collect in the exhaust line. Drain holes may be used; these must channel the fluid to the outside via pipes that are sealed towards the interior.

See the "Statutory regulations governing installation" for further regulations.

The heater may also be operated with a silencer.

Length of the exhaust line:	max. 5 m
Internal diameter of the line:	38 mm
Minimum bending radius:	85 mm
Total bends:	max. 360°

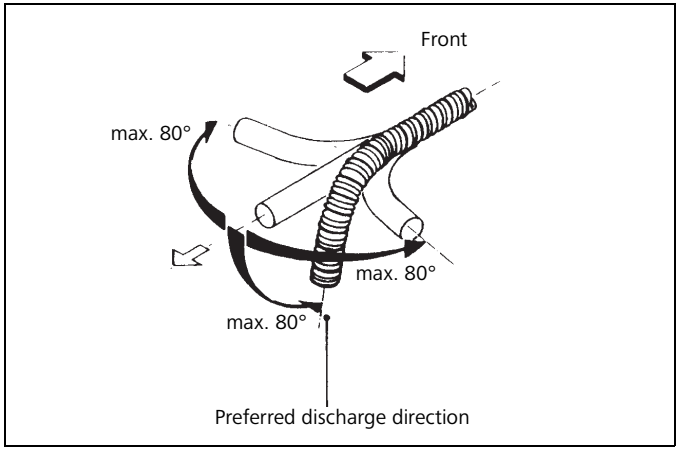


Figure 11: Exhaust pipe opening
(Installation position)

9 Electrical connections

9.1. Control unit / heater connection

The electrical connection of the heaters is made as shown in Figures 16 to 18.

9.2. Connecting the controls

The heater can be switched on and off using the following Webasto controls:

- Switch
- Cabin thermostat (mechanical)
- Digital timer (24 hour)

If a digital timer is used, the 8-pin blade terminal type AMP 163-007-0 ID no. 178 764 must be ordered separately.

The controls are connected in accordance with the sample applications shown in Figures 19 and 20.

	12 V	24 V
F1	20 A	20 A
F2	20 A	20 A
F3	10 A	7.5 A

Figure 12: Blade-type fuses (overview)

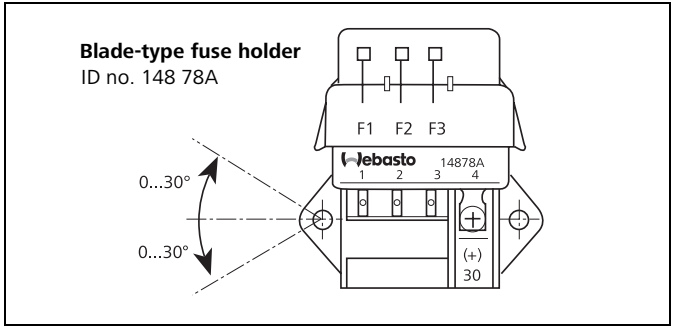


Figure 13: Fuse holder (installation position)

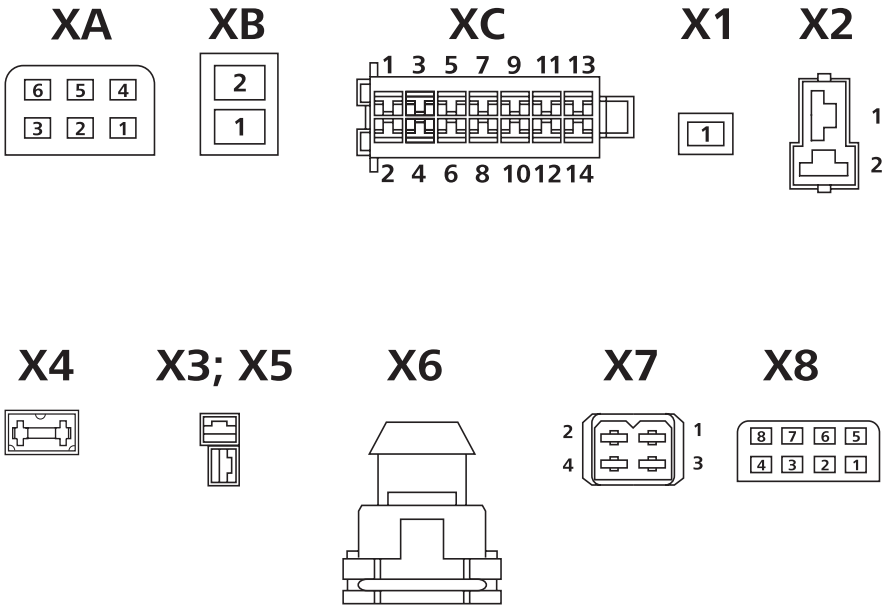
9.3. Control unit

NOTE

Control units for the 12 volt version have red lettering, those for the 24 volt version have green lettering.

Fit an insulation housing onto the blade receptacles when connecting to the switch due to the risk of a short circuit. The cable bridges required for connection should be made yourself as shown in the connection diagram.

For plugs, see circuit diagrams Figure 16 to Figure 20



Cable cross-sections	
<7.5 m	7.5 -15 m
0.75 mm²	1.5 mm²
1.0 mm²	1.5 mm²
1.5 mm²	2.5 mm²
2.5 mm²	4.0 mm²
4.0 mm²	6.0 mm²

Cable colours	
bl	Blue
br	Brown
ge	Yellow
gn	Green
gr	Grey
or	Orange
rt	Red
sw	Black
vi	Violet
ws	White

Figure 14: Plug connector

Item	Designation	Comment
A1	HL 90 heater	24 V
A1	HL 90 heater	12 V
A2	Control unit	24 V
A2	Control unit	12 V
B1	Flame monitor	12/24 V
B2	Temperature limiter	12/24 V
B3	Cabin thermostat	12/24 V
E	Glow plug	4 V
F1	Blade-type fuse	24 V 20 A
F1	Blade-type fuse	12 V 20 A
F2	Blade-type fuse	24 V 20 A
F2	Blade-type fuse	12 V 20 A
F3	Blade-type fuse	12 V 10 A
F3	Blade-type fuse	24 V 7.5 A
H1	Switch-on indicator heating 24 V	
H1	Switch-on indicator heating 12 V	
H2	Switch-on indicator heating/ventilation 12/24 V	
H2	Switch-on indicator heating/ventilation 12/24 V	
H3	Symbol light for digital display	
H4	Ready indicator heating	
H5	Switch-on indicator heat-	
K1	Relay	In control unit
K2	Relay	In control unit
K3	Relay	In control unit
K4	Relay	In control unit
K5/K6	Relay (as required)	24 V
K5/K6	Relay (as required)	12 V
M	Motor	24 V

Item	Designation	Comment
M	Motor	12 V
P	Digital timer 1522	24 V
P	Digital timer 1522	12 V
R1	Resistor	24 V
R1	Resistor	12 V
R2	Glow plug series resistor.	24 V
R2	Glow plug series resistor	12 V
S1	4-stage switch	
S2	On/off switch	
S3	Full load/part load heating switch	
S4	Full load/part load heating thermostat	
S5	Full load/part load ventilation switch	
S6	Battery switch	In vehicle
T	Transistor	In control unit
XA	Plug connection for recep-	6-pin
XB	Plug connection for recep-	2-pin
XC	Plug connection for recep-	14-pin
X00	Terminal connection	Glow plug -
X0	Terminal connection	Glow plug +
X1	Plug connection	1-pin
X2	Plug connection	2-pin
X3	Plug connection	2-pin
X4	Plug connection	2-pin
X5	Plug connection	2-pin
X6	Plug connection	2-pin
X7	Plug connection	4-pin
X8	Plug connection	8-pin
Y	Metering pump	24 V
Y	Metering pump	12 V

Figure 15: Legend to the circuit diagrams Figure 16 to Figure 18

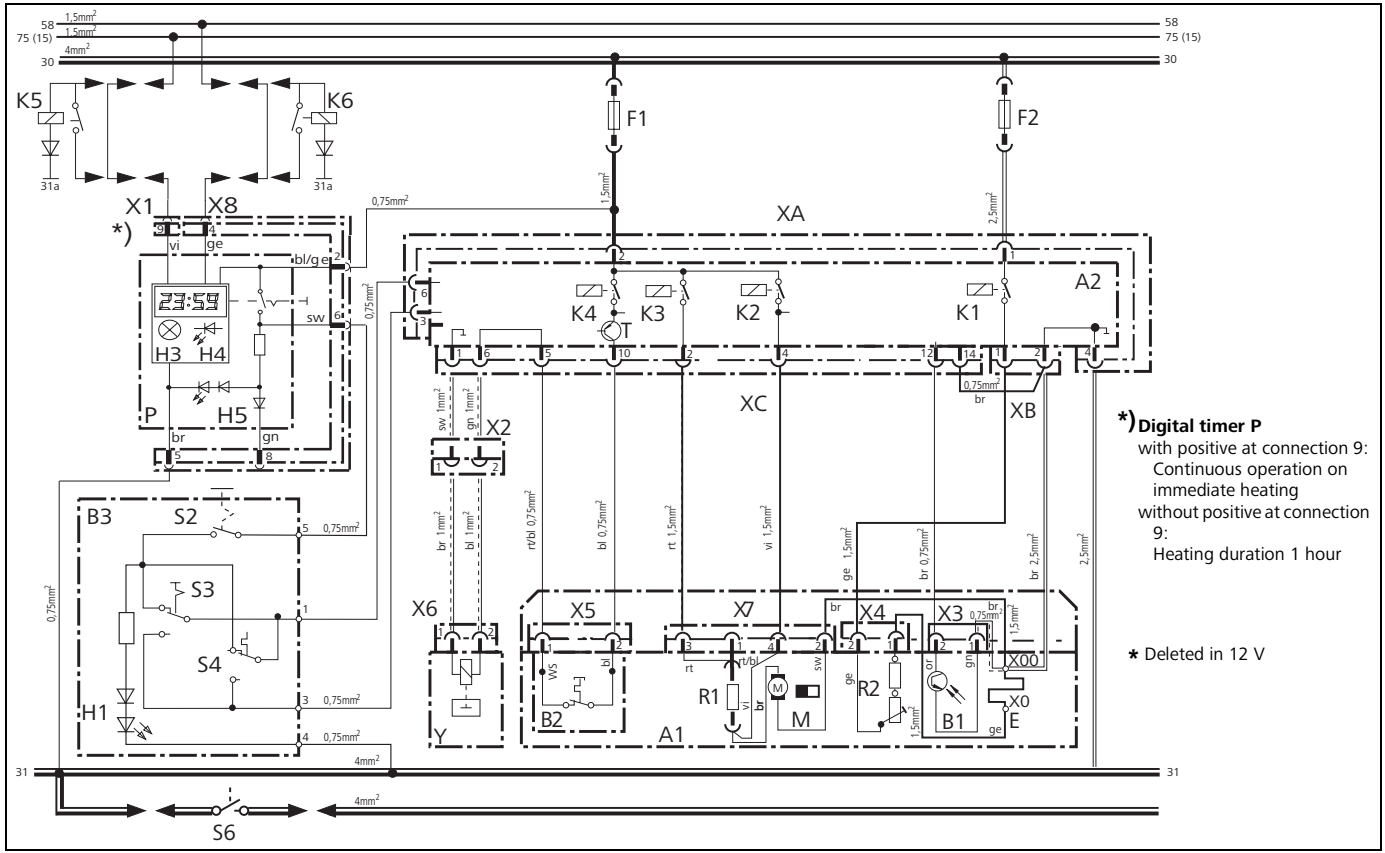


Figure 16: Operation with digital timer and cabin thermostat

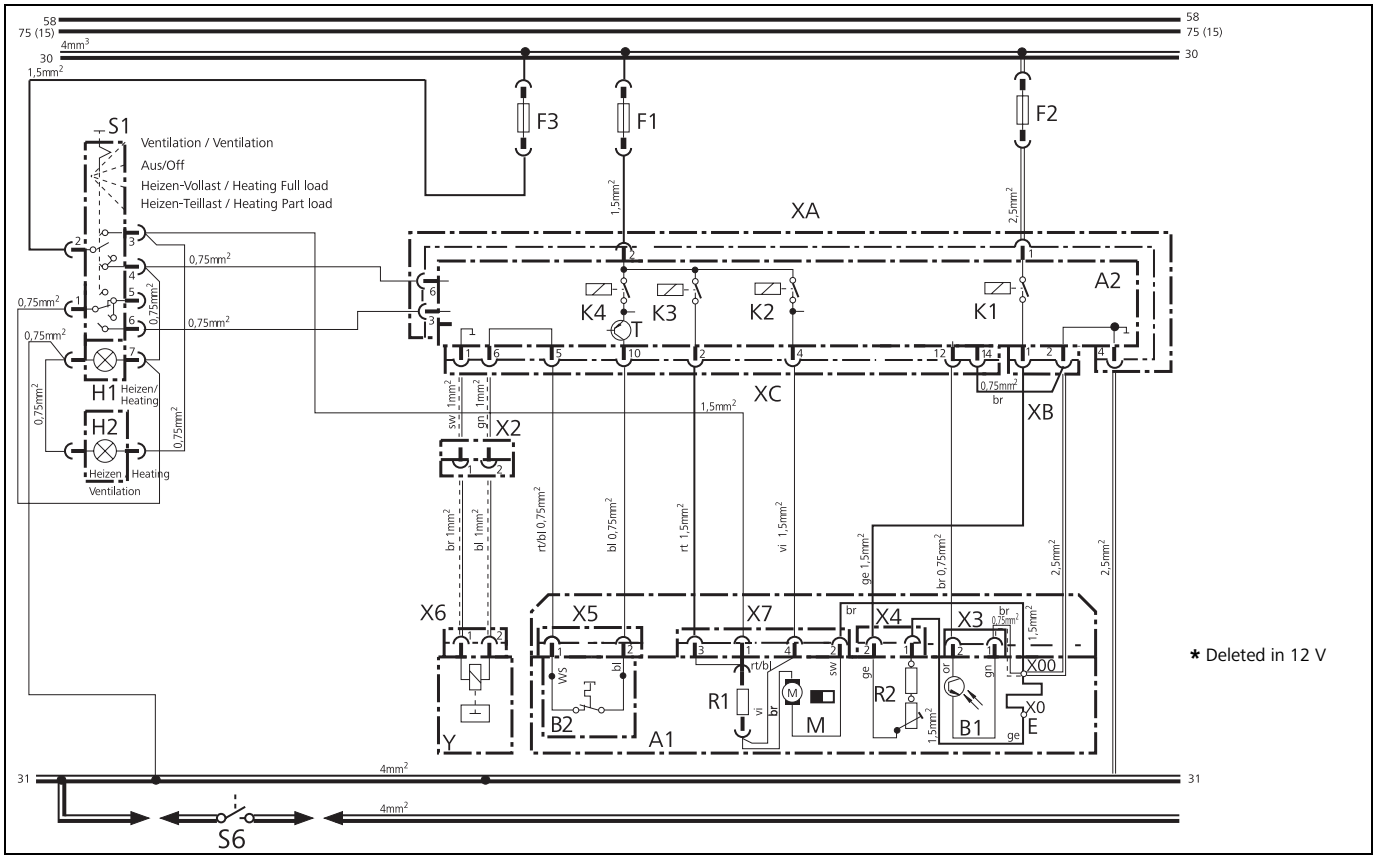


Figure 17: Operation with switch (full load/part load) and ventilation

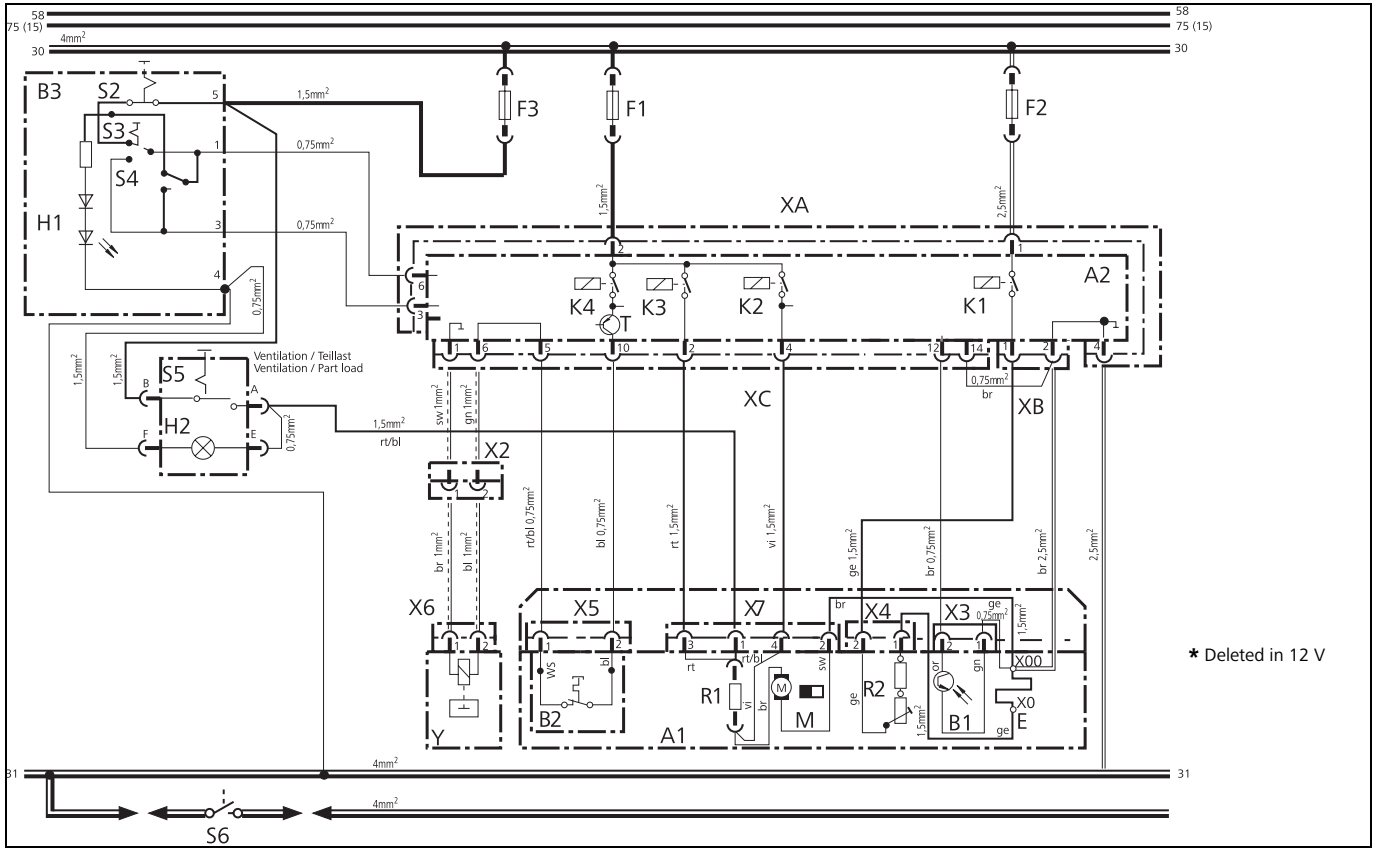


Figure 18: Operation with cabin thermostat (full load/part load) and ventilation

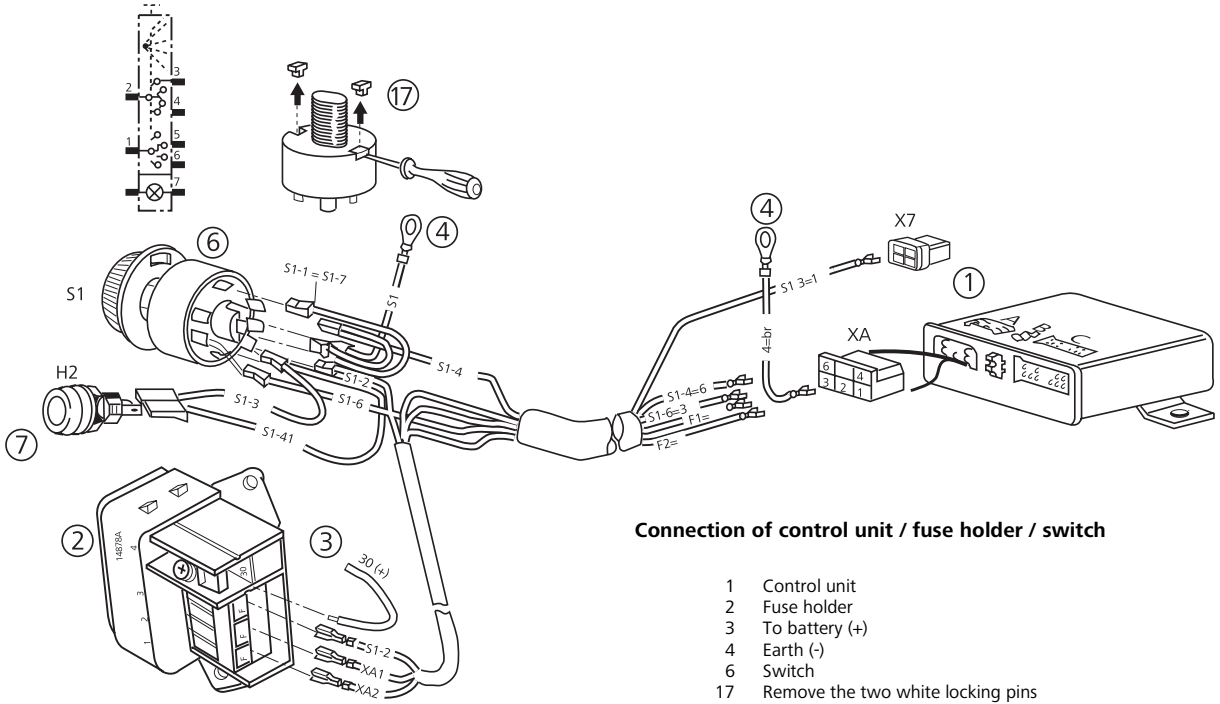


Figure 19: Sample application in conjunction with automatic circuit diagram

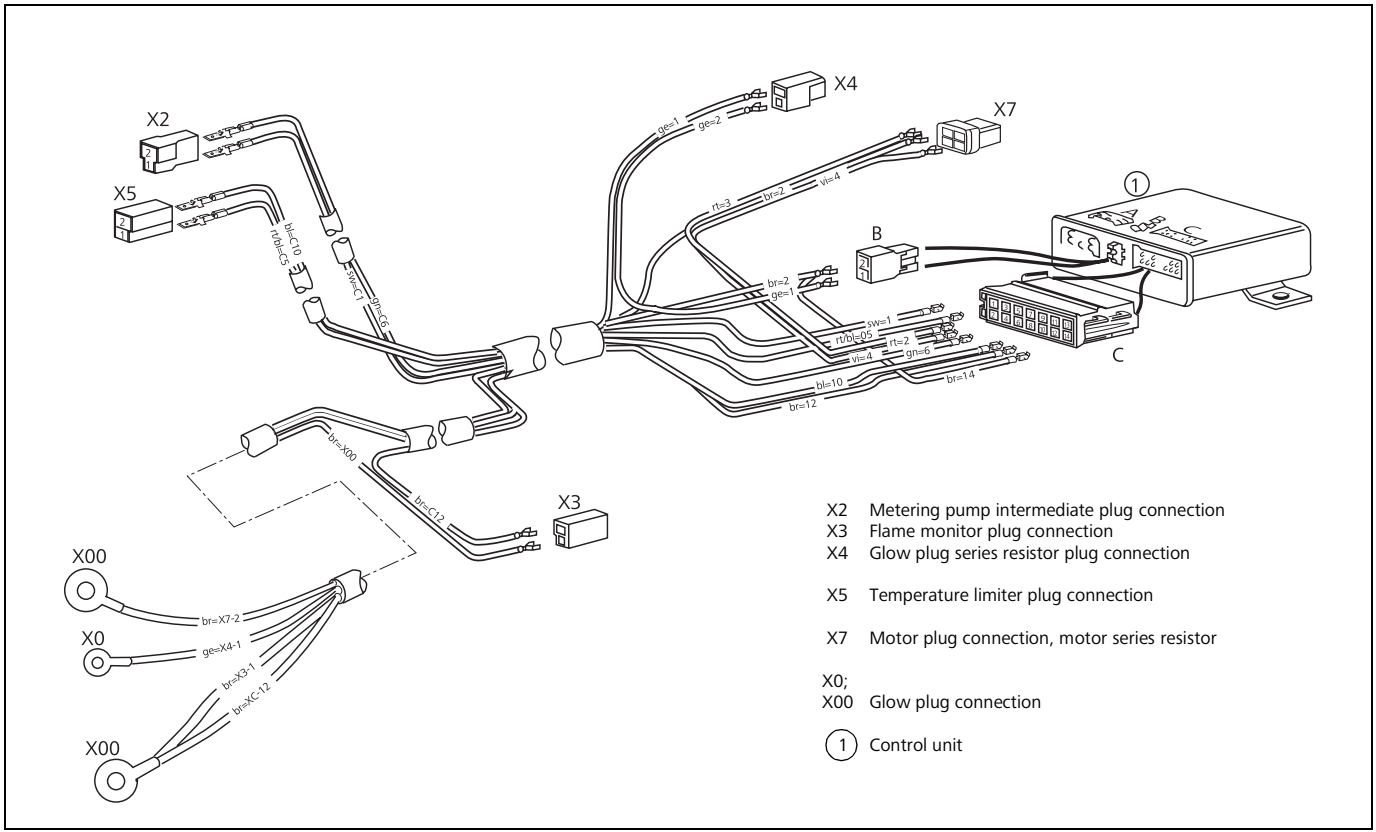


Figure 20: Sample connection

10 Initial start-up

After you have installed the heater, bleed the fuel supply system carefully.

NOTE
If the fuel lines are long, it may be necessary to switch on several times in order to fill the fuel line to the heater.

Conduct a trial of the heater to check all the connections for leaks and to ensure that they are secure. If the heater suffers a fault during operation, the fault must be located and remedied.

11 Technical data

Except where limit values are specified, these technical data refer to the usual heater tolerances of ±10 % at an ambient temperature of +20 °C and at the rated voltage.

11.1. Electrical components:

Control unit, motor, metering pump, glow plug series resistor, part load resistor, digital timer and switch with lamp are designed for either 12 V or 24 V.

The temperature limiter, flame monitor and glow plug components are identical on 12 V and 24 V heaters.

The nominal voltage of the glow plug is 4.2 V.

Heater				HL 90
Type				HL 90
ECE homologation				EMC: E1 04 1086 Heater: E1 00 0017
Model				Air heater with rotation evaporator
Heating current		Full load Part load	kW kW	9 6.5
Fuel				Diesel/heating oil EL
Fuel consumption		Full load Part load	kg/h (l/h) % by vol.	1.00 (1.20) 0.71 (0.86)
Rated voltage			V-	12 or 24
Operating voltage			V-	10 ... 14.5 or 20.5 ... 29
Rated power consumption (not in starting operation)		Full load Part load	W W	110 80
Max. ambient temperature during operation: - Heater - Control unit - Metering pump			 °C °C °C	 -40 ... +50 -40 ... +85 -40 ... +40
Max. storage temperature: - Heater - Control unit - Metering pump			 °C °C °C	 -40 ... +85 -40 ... +85 -40 ... +85
Max. hot air inlet temperature			°C	+30 max.
Delivery rate for hot air against 0.5 mbar at against 0.25 mbar at		 full load part load	 m^3/h m^3/h	 280 195
CO_2 in exhaust gas (at full load): - Permitted function range			 % by vol.	 7 ... 10
CO in exhaust gas	- In still air - At 100 km/h		% by vol. % by vol.	0.1 max. 0.2 max.
HC in exhaust gas (at rated load and in still air)			% by vol.	0.01 (100 ppm) max.
NOx in exhaust gas (at rated load and in still air)			% by vol.	0.02 (200 ppm) max.
Soot index	- Bacharach method			4.0
Heater dimensions: (tolerance ±3 mm)		Length Width Height	mm mm mm	650 235 260
Metering pump dimensions: (tolerance ±3 mm)		Length Width Height	mm mm mm	113 40 35
Control unit 1561 dimensions: (tolerance ±3 mm)		Length Width Height	mm mm mm	97 102 36
Weights:	Heater Control unit Metering pump		kg kg kg	13 0.30 0.35

Im Fall einer mehrsprachigen Version ist Deutsch verbindlich.
Die Telefonnummer des jeweiligen Landes entnehmen Sie bitte dem Webasto Servicestellenfaltblatt oder der Webseite Ihrer jeweiligen Webasto-Landesvertretung.

In multilingual versions the German language is binding.
The telephone number of each country can be found in the Webasto service center leaflet or the website of the respective Webasto representative of your country.

Dans le cas d'une version rédigée en plusieurs langues, l'allemand est alors la langue qui fait foi.
Pour trouver le numéro de téléphone du pays concerné, veuillez consulter le dépliant des points-service Webasto ou la page web de la représentation Webasto de votre pays.

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